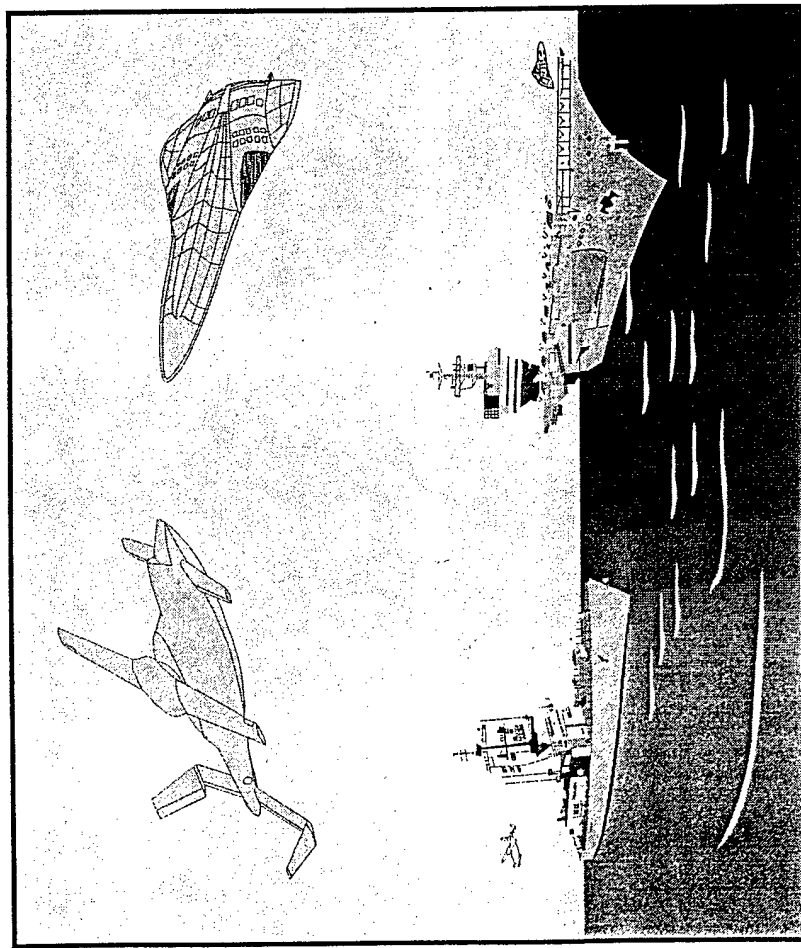


REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate only, other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (07804-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (LEAVE BLANK)		2. REPORT DATE 1998		3. REPORT TYPE AND DATES COVERED Professional Paper
4. TITLE AND SUBTITLE Future Naval UCAV Applications & Enabling Technologies			5. FUNDING NUMBERS	
6. AUTHOR(S) Julieta E. Booz				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Air Warfare Center Aircraft Division 22347 Cedar Point Road, Unit #6 Patuxent River, Maryland 20670-1161			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words)				
14. SUBJECT TERMS			15. NUMBER OF PAGES	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT SAR	



Future Naval UCAV Applications & Enabling Technologies

Julietta E. Booz
NAVAIR UCAV ADPO,
AD DEPUTY
(301) 342-8574

CLEARED FOR
OPEN PUBLICATION

JUN 4 1998

PUBLIC AFFAIRS OFFICE
NAVAL AIR SYSTEMS COMMAND

J. E. Booz

DTIC QUALITY INSPECTED 1

19980810 075



Why Should the Navy Invest In UCAVs?



- Drawdown in its force structure & dollars available
- An affordable alternative in acquisition & O&S costs
- State-of-the-Art computing power and flight control algorithms have us on the brink of this capability
- Potential to revolutionize Naval approach to warfighting by opening the design space:
 - Unusual attitudes & orientation
 - Operational duration & missions
 - Reduce or eliminate maintenance & training req'ts
 - Sustain higher g-forces and onset rates
 - Apply innovative manufacturing concepts
 - Expanded basing options



NAVAL



TEAM

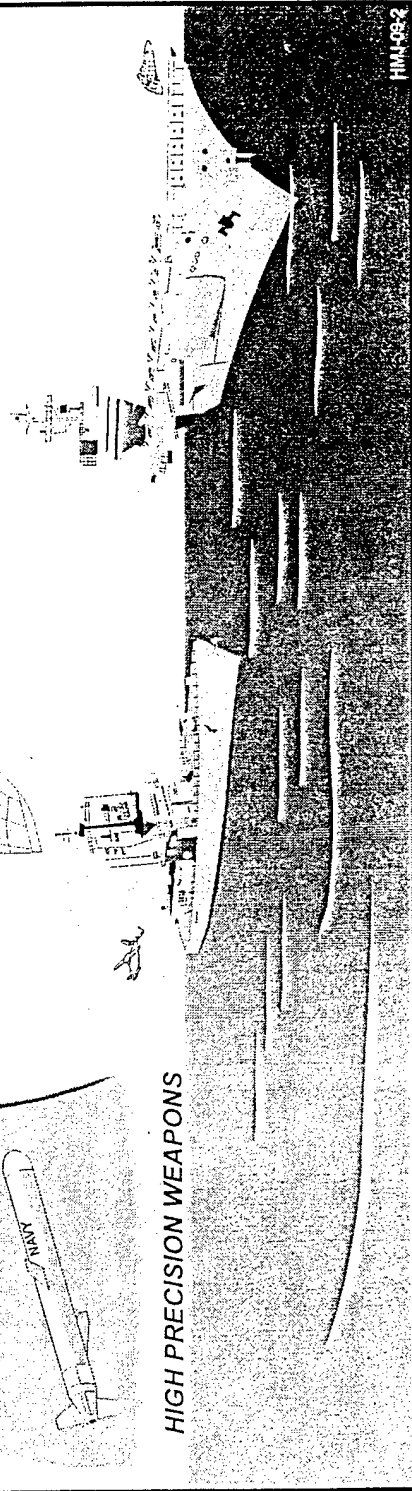
UNINHABITED COMBAT AIR VEHICLE

HIGH PERFORMANCE MANNED AIRCRAFT UNINHABITED AIR VEHICLES



HIGH PRECISION WEAPONS

- Multi-Role Uninhabited Lethal Vehicle
- Shipboard Launch and Recovery
- Urban/Rough Field Operation
- Enhanced Affordability
- Minimum Maintenance
- Capability for Full Autonomy
- Integrated System, not just Air Vehicle



HML-092



Ongoing Programs & Efforts



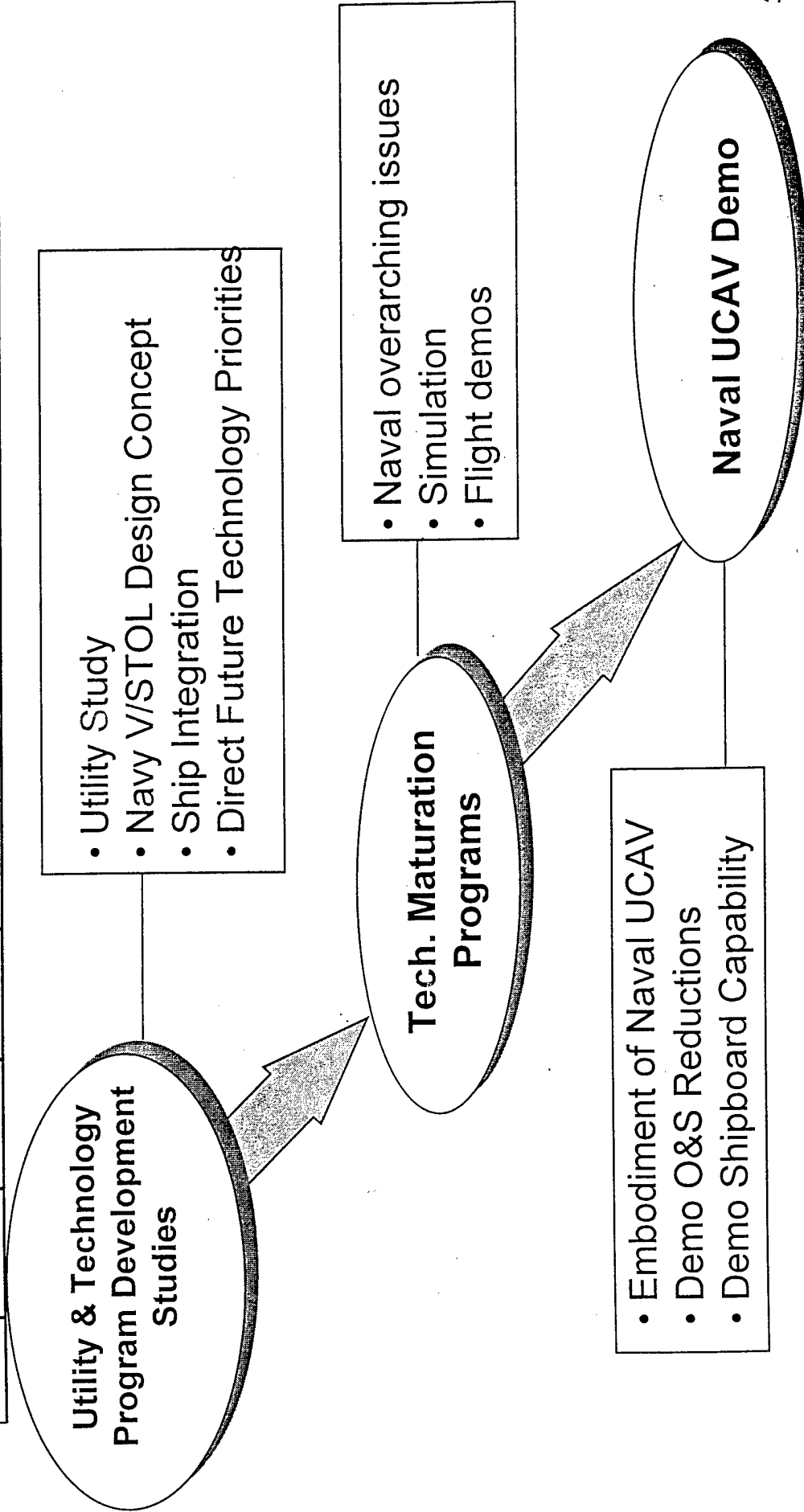
- Navy - ONR UCAV Initiative
CNO SSG UAV/UCAV XVI & XVII
OPNAV UAV Payloads IPT
DON UAV Workshop
- Marine Corps - Draft MNS for Strike UAVs
- Air Force/DARPA - UCAV ATD
Phase I contracts awarded in April
Phase II will build & fly demo UCAV
- Air Force/France - Integrated Tactical A/C Control
Devel & eval cooperative flight operations
- NASA - Sponsored design studies for UCAV concepts
Follow-on efforts addressing hyper-agility
- England - Virtual UCAV designs for con-ops development
- TTCP - Workshop "UAV's on the Battlefield 2015"



ONR Programmatic Plan



98	99	00	01	02	03	04	05	06	07	08
----	----	----	----	----	----	----	----	----	----	----





Utility Study



Purpose - Identify Potential Naval UCAV Missions

Basis - Joint Vision 2010 - Navy Unique, First Days of War

Missions Considered -

[• SEAD]

[• Close Air Support]

• Mobile/Moving
Targets

[• ASW]

• ISR

• Halt Invasion

• No-Fly Zone

• ASUW

• Mining

• Chemical, Biological,
Radiological

[• Fixed Targets]

• Command & Control Centers

• Information Suppression

• Combat Air Patrol

[Navy]

[AF/DARPA]



UNSA Concept Designs



- Uninhabited Naval Strike Aircraft (UNSA) study comprises 3 tasks:
 - 1 Configuration Definition
 - Surface-ship Short TakeOff & Vertical Landing (STOVL)
 - Surface-ship Vertical Attitude TakeOff & Landing (VATOL)
 - Sub-launched VATOL
 - 2 Vehicle Characteristics and Performance
 - Design layouts, system/subsystem descriptions
 - Weight estimates
 - Aero-performance estimates, mission, point, and VTOL capability
 - 3 Critical Technology Review
- **Studies Conducted by:**
 - Lockheed Martin
 - Boeing
 - Northrop-Grumman
 - NAWCAD
- **Final oral reports April-Aug 98**



Ship Integration Study



APPROACH

Addressing DDG class ships & rotorcraft air vehicles by:

Developing, Integrating and Validating

- Ship Airwake Models
 - Apply current NASA Model, PENN State Model & Shipboard data
- Air Vehicle Models for Rotorcraft Vehicles
 - Validate with existing vehicles
- Develop a scaling model
 - Apply advanced concept vehicles (Canard Rotor Wing)
- UAV Pilot/Vehicle/TCS Control Req'ts.

TECH CHALLENGES

- Accurately modeling existing system for shipboard environment
- Scaling model to accurately predict ship airwake forces acting on vehicles varying from UAVs to full size manned vehicles

EXIT CRITERIA

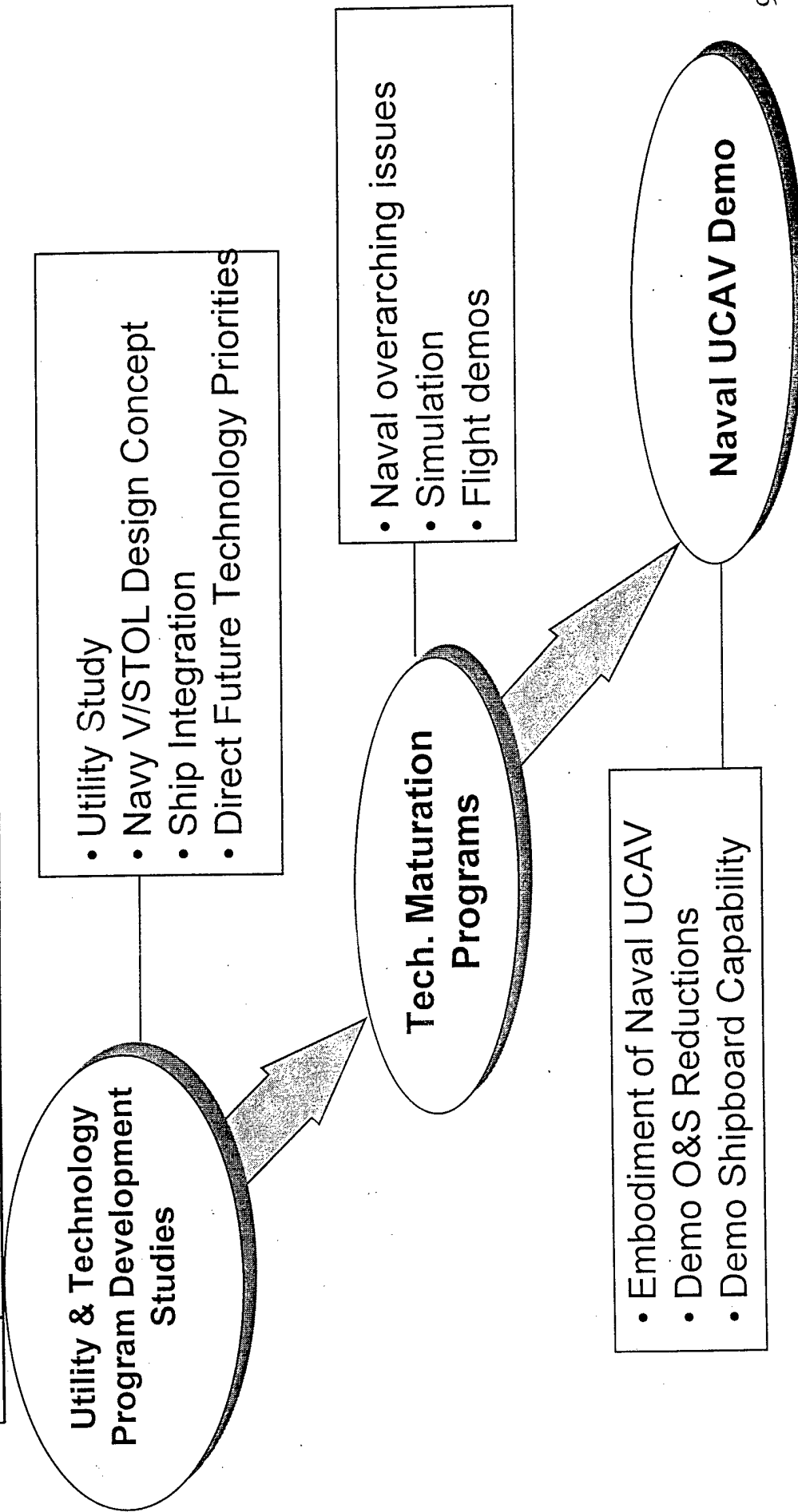
- Validation with current rotorcraft flight test data
- Successful simulation of interaction of vehicle in operational environment
- Application & Validation of simulation with Boeing/DARPA CRW flight test data



ONR Programmatic Plan



98	99	00	01	02	03	04	05	06	07	08
----	----	----	----	----	----	----	----	----	----	----





Tech. Maturation Program



FY00	FY01	FY02	FY03
------	------	------	------

- **UCAV V/STOL Flight Controls & Autonomous Decision Making**

- Capability to perform Naval missions such as all-weather shipboard launch and recovery, aerial refueling, target ID, in-flight route planning, self-monitoring, etc.

- **UCAV Affordable Unitized Structures**

- Leverage concepts from weapon design, but capable for shipboard launch & recovery

- **Compact Virtual UCAV Control Station**

- Control stations which meet the limited space constraints of a ship or truck

- **V/STOL UCAV Urban Warfare Aerodynamics**

- Flight requirements for flying between buildings



UCAV SUMMARY



- UCAVs Seen as Future Weapon System for Projection of Long Range, Sustainable, Lethal, Combat Power
 - Greatly reduced acquisition and O&S costs
 - Mix of manned and uninhabited systems envisioned
- Current USAF focus on lethal SEAD and fixed target attack
- Current Naval focus
 - Close Air Support
 - ASW
- Technology requirements continue to be identified
 - Many needs common with manned systems
 - Command and Control is key